

# THE GENUS *BULLINA* (OPISTHOBRANCHIA, GASTROPODA) IN NEW ZEALAND

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PLATE 18

## ABSTRACT

A study of shells of the genus *Bullina* from collections in New Zealand, show that there are a number of species in local waters. The shell, radula, jaw-plates and external features of *Bullina lineata* (Gray, 1825) and a new species, *Bullina roseana*, are described. The shells of two other species, most probably *Bullina melior* Iredale, 1929 and *Bullina lauta* Pease, 1860 are described. Shells of other specimens collected in New Zealand are described and illustrated, but the author did not feel an attempt at identification, or description as new species, was warranted at this stage.

## INTRODUCTION

Until now, *Bullina lineata* was the only recorded species of the genus from New Zealand. Since the first record (Hutton, 1873), a number of recordings of the species have been made from the north of the country. These records are restricted to the east coast of the North Island, all except two, being north of the Hauraki Gulf and Great Barrier Island. Although shells have been washed up on beaches, it would seem that this species is restricted to the sub-littoral in New Zealand. *Bullina lineata*, a common Indo-Pacific species, is found inter-tidally in south-eastern Australia (Allan, 1959; Iredale, 1929), but at the northern limit of its geographical range, Honshu, Japan, it is restricted to the sub-littoral zone (Kira, 1962).

While dredging in the Bay of Islands for this species, a live animal of a new species of *Bullina* was discovered. A consequent study of the shells of *Bullina*, collected from New Zealand, has shown that other species of *Bullina* also occur in these waters. The following study considers both identifiable specimens and those which do not fit any described species. Although some of these are most probably new species, it was considered undesirable to compound the confusion which already exists within the genus. All species have been described from shells alone, and their descriptions range from adequate to most inadequate.

### Genus *Bullina* Ferussac, 1822

Type species: *Bulla lineata* Gray, 1825, (subsequent designation, Gray, 1847).  
Synonym: *Bullinula* Swainson, 1840.

### *Bullina lineata* (Gray, 1825).

Pl. 18, I - J; Fig. 2, A - D.

Synonymy: *Voluta scabra* Gmelin, 1791, p. 3434; non Muller, 1874.  
*Voluta ziczac* Muhlfeldt, 1818, p. 5, pl. 1, fig. 4; non Schroter, 1804.  
*Bulla lineata* Gray, 1825, p. 408.  
*Aplustrum lineatum* Hutton, 1873, p. 52.  
*Bullina lineata* Hutton, 1880, p. 120.  
*Aplustrum scabrum* Watson, 1886, p. 633 - 4.  
*Bullinula ziczac* Iredale, 1915, p. 477.  
*Bullinula lineata* Powell, 1946, p. 88., et. seq.

Shell ovate, sides almost straight; white with two distinct red spiral lines dividing each whorl into three approximately equal parts. A diffuse red spiral line usually exists, running around base of shell. Eight to ten equi-spaced, sinuous, red axial lines run across body whorl. Spire approximately one seventh of shell height, protoconch large, whorls shouldered. Sculpture distinct; wide, smooth spiral ridges, separated by punctate grooves, half width of ridges, transverse bars across grooves forming small rectangular hollows. Aperture large, narrowing at both ends; outer lip thin, joining body whorl either at, or below, the upper red spiral line. Suture shallowly channelled. Columella straight, slightly truncated at base, free edge recurved forming small umbilical opening. Inner lip forming thin glaze over aperture region of body whorl.

Operculum chitinous and thin, nucleus distinct at lower left (inner) corner; long thin muscle scar runs up inner side.

Radula formula 11.1.11; central tooth small, elongate plate; lateral teeth all of similar shape, having long basal plate, outer edge rising to form an incurved posteriorly facing flange, bearing four denticles on posterior edge. Inner nine rows of laterals of same size, outer two rows approximately half of this size.

Jaw plates consist of individual triangular denticulate elements.

Animal blue, foot and headshield bordered by brilliant iridescent greeny-blue edge. Headshield extends posteriorly to form a large posterior process on each side, partly lying over shell. On each side of the head, headshield can fold to form a pair of temporary funnels leading water back over sensory Hancock's organs. Posterior end of mantle forms process lying alongside right side of spire, directing exhalant water current from mantle.

Small pair of black eyes visible on head between posterior processes of the headshield. Foot large and thin, extending behind shell and to each side. Anterior edge of foot forms lateral triangular processes, so forming a wide blunt leading edge. The full anatomy and functional morphology of this, and the following species, will be discussed separately.

#### NEW ZEALAND OCCURRENCES:

Bland Bay, Whangaruru; Matapouri, Tutukaka Harpour; Whangapoua, East Coast — Gt. Barrier Is.; Oruawharo, East Coast — Gt. Barrier Island; Port Fitzroy, Gt. Barrier Is.; Spirits Bay; Houhora Heads; Tokerau Beach, Doubtless Bay; Whangaroa Heads, 32 m; Little Barrier Is.; 36 m; Buffalo Beach, Whitianga; Mt. Maunganui, Tauranga; Bay of Islands.

The live specimens studied in this paper were dredged in the Bay of Island, S.W. of Waewaetorea Is. in 11-14 m.

#### DISTRIBUTION:

This species is probably widely distributed throughout the Indo-West Pacific. There are many references in the literature to *Bullina lineata* or to one of its many synonyms. The accuracy of these identifications must however remain in some doubt, as in most cases, only the shell was found. Reliable records do exist for all the main islands of Japan (Habe, 1955), for the east coast of Australia (Allan, 1959; Iredale & McMichael, 1962; Macpherson, 1958), and New Zealand. Specimens from Norfolk

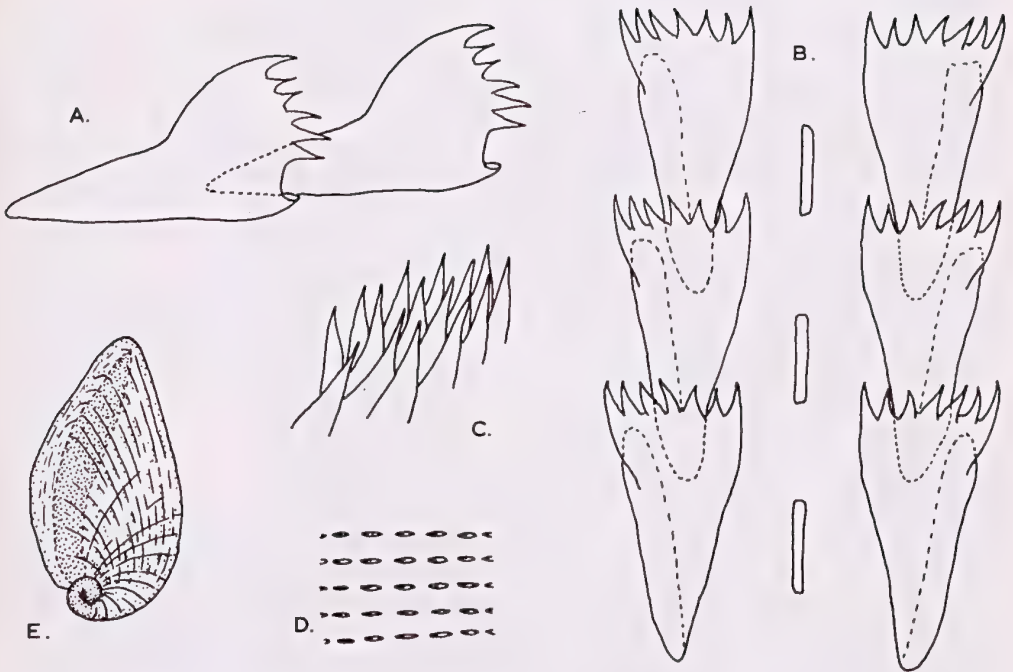


Fig. 1. *Bullina roseana* n.sp.

A, radula teeth, lateral view; B, radula, dorsal view of central and inner laterals; C, part of jaw plates, showing rods; D, sculpture of shell; E, operculum.

Is.; Lifu, Loyalty Is.; New Caledonia and Lord Howe Is. are in the collection of the Australian Museum, Sydney (W. F. Ponder — pers. comm.). Watson lists other occurrences at Java and Mauritius (Watson, 1886), and there are many reports of it occurring in Hawaii.

*Bullina roseana* n.sp.

Pl. 18, H; Fig. 1, A - E.

Shell ovate, globose, umbilicate; pinkish white with two pink spiral lines dividing whorl into 3 parts, the middle one being twice the width of the outer two. A diffuse spiral band runs around base of shell. Axial red lines not well marked except for short lines running down from suture halfway to upper pink spiral line. Approximately 7 axial lines on body whorl. Spire low, approximately one ninth of shell height, protoconch large, whorls rounded. Sculptured with wide smooth spiral ridges, separated by narrow punctate grooves, approximately one third to one quarter the width of ridges. Transverse bars across grooves, wide, forming strings of oval pits. Aperture large, narrowing at upper end and slightly at lower end; outer lip thin, joining body whorl just above upper red spiral line. Suture channelled. Columella white, straight, broad, slightly truncated at base, free edge slightly recurved to form umbilical opening. Inner lip forming calcified layer over lower half of aperture region of body whorl.

Operculum similar to *Bullina lineata*.

Radula formula 18.1.18; central tooth small elongate plate; lateral teeth all of similar shape and size, having long triangular basal plate, outer edge rising, as in *B. lineata*, to form high, wide incurved flange, bearing six or usually seven, denticles on the posteriorly facing edge. Outer denticle on each side usually larger than inner denticles.

Jaw plate appears to consist of individual rods. (It is possible that compound plates as in *B. lineata* occur in this species. These plates may have been broken into individual rods during the extraction process which requires chemical maceration of the surrounding tissues).

Animal white, slight brown area above mouth. Headshield extending posteriorly on each side to form large pair of flaps partly covering shell. On either side of the headshield, at anterior end, a permanent funnel is formed, leading water down over chemosensory Hancock's organs. As in *B. lineata*, the posterior edge of the mantle is developed into an exhalant siphon. Foot large and thin, extending posteriorly to limit of shell, and extending laterally at anterior end.

#### LOCALITY:

One specimen dredged alive from 15 m south west of Waewaetorea Is., Bay of Islands, September 1969.

#### HOLOTYPE:

The shell, unfortunately damaged in removing animal, and radula mount are deposited in the collection of the Dominion Museum, Wellington, Reference No. M24090. Height of shell 12.5 mm; diameter 8 mm.

#### REMARKS:

A study of references to all other described species show that this species is quite distinct from them. Points of difference will be fully discussed in the concluding discussion. The external features of the animal immediately distinguish it from *Bullina lineata*. Whereas *B. lineata* is brilliantly coloured, *B. roseana* is pure white; the foot of the former extends behind the shell when the animal is moving while in the latter the foot does not. In *B. roseana* a siphon on either side of the head forms a permanent channel to the Hancock's organ whereas in *B. lineata* no such permanent siphon exists. The radula also shows considerable differences. As will be shown separately, there are considerable anatomical differences between the two species. Unfortunately no information is available concerning the animal or anatomy of other species of the genus. This species is named after my mother.

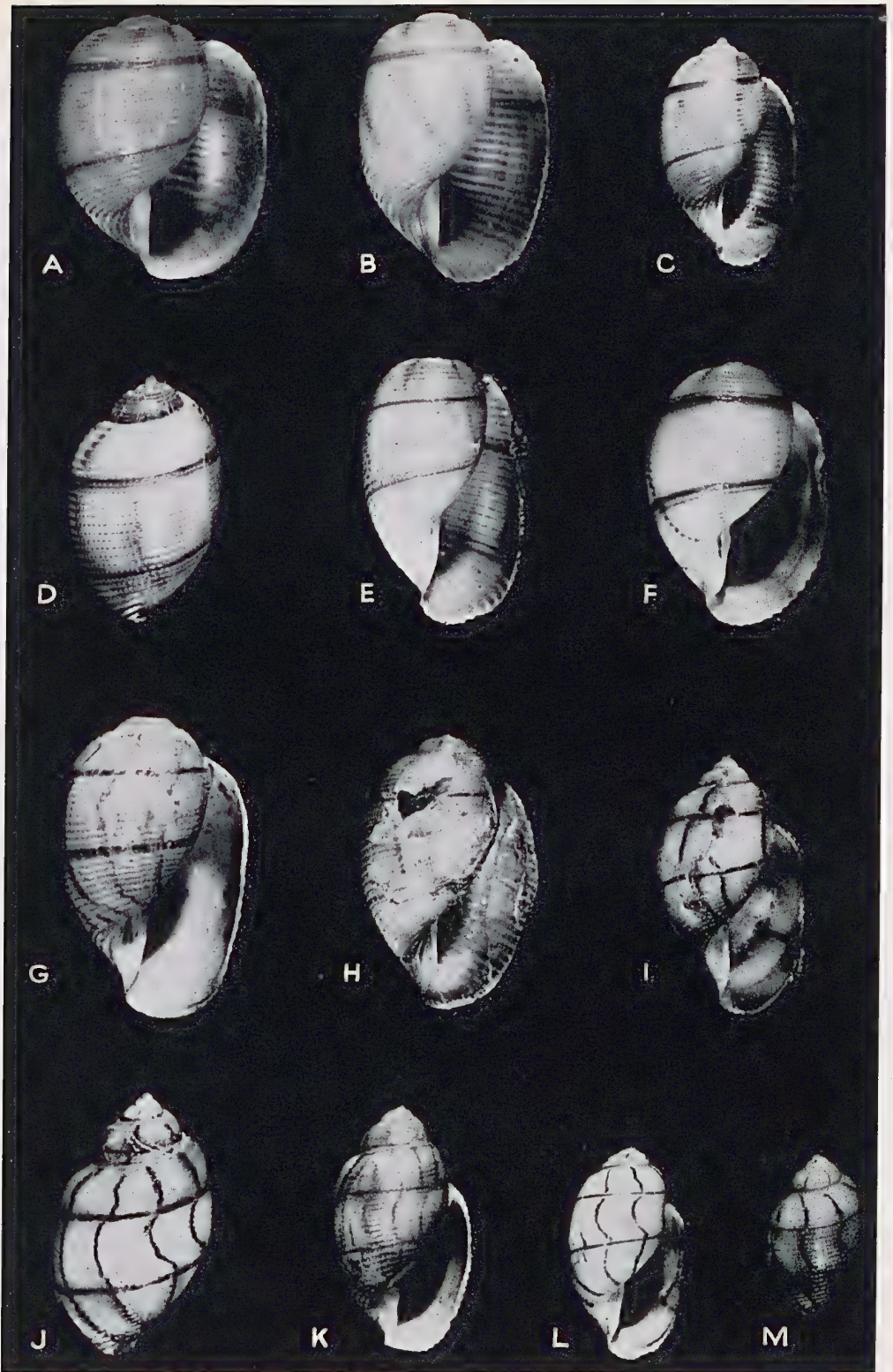
*Bullina cf. melior* Iredale, 1929.

Pl. 18, A - B, F - G.

Iredale described *B. melior* from a specimen dredged in Sydney Harbour from 4 fathoms. In his description he states that, "it is broader

PLATE 18. A, *Bullina melior?*, coll. Tokerau Beach, Doubtless Bay, 14 x 11 mm. B, *Bullina melior?*, coll. Okiwi, Gt. Barrier Island, 15 x 10.5 mm. C, D, *Bullina* sp., coll. between Sydney and Cronulla, New South Wales, in 80 m, 8 x 5 mm. E, *Bullina* sp., coll. Bay of Islands, 12 x 8 mm. F, *Bullina melior?*, coll. Okiwi, Gt. Barrier Island, 12.5 x 9 mm. G, *Bullina melior?*, Dom. Mus. Coll. M.709. No locality data, 20 x 12.5 mm. H, *Bullina roseana* n.sp. Holotype, coll. Bay of Islands, 12.5 x 8 mm. I, J, *Bullina lineata*, coll. Bay of Islands, 15 x 8.5 mm. K, *Bullina cf. lauta*, from N.W. Gardner Collection, no locality data, 12 x 7 mm. L, M, *Bullina cf. lineata*, coll. Collaroy, New South Wales. Dom. Mus. No. M.F. 8299. Axial coloured lines are brown. 11.5 x 6; 9.5 x 5.

Photo — G. W. Batt.



(than *B. lineata*) with a more depressed spire and stronger sculpture, apical whorls apparently white. Shell broadly ovate, spire depressed, thin, columella truncate”.

From the full description and illustration it is most probable that a number of specimens I have seen from New Zealand collections belong to this species. Four of these specimens are illustrated in Plate 18. They will be discussed separately.

Specimen a. Pl. 18, A.

From the collection of Mr and Mrs N. W. Gardner, Auckland. Collected from Tokerau Beach, Doubtless Bay. Upper lip of shell joins just above upper red spiral line. Suture deeply canaliculate. Columella is only slightly truncated. Sculpture similar to Fig. 2E. Shell solid, spire depressed.

Specimen b. Pl. 18, B.

From Gardner collection, collected Okiwi, Gt. Barrier Is., June 1963. Upper lip joins at upper red line. Suture deeply channelled. No lower red spiral line. Sculpture similar to specimen “a” but spiral channels only half width of ridges. Columella straight.

Specimen c. Pl. 18, F.

Collected with specimen “b”. Upper lip joins at upper red spiral, sculpture similar to Fig. 2 E. Columella truncated.

Specimen d. Pl. 18, G.

Dominion Museum collection M.709. No locality record other than “N.Z.”. Upper lip joins at upper red spiral, sculpture as in specimen “b”. Columella truncated.

#### REMARKS:

These four specimens are larger and more heavily calcified than either *B. lineata* or *B. roseana*, the spire is depressed, the red spiral lines are more diffuse, and in some cases are double. All these features and the sculpturing are consistent with Iredale's description of *B. melior*. In two cases, specimens “c” and “d”, there is a truncated columella consistent with *B. melior*, but in the other two cases the columella is straight. These specimens are definitely neither *B. lineata* nor *B. roseana* and it is probable that they belong to *Bullina melior*.

#### *Bullina lauta* Pease, 1860

Pl. 18, K

Synonymy: *Bullina scabra solida* Pilsbry, 1920, p. 362-3.

The original description of *Bullina lauta*, a species from Hawaii, is not very adequate. However a study of photographs of the holotype, kindly provided by Dr J. D. Taylor of the British Museum (Natural History) and of published information of Pease's types (Kay, 1965) show that this species can be typified by the shell, more heavily calcified than in *B. lineata*, and the axial red lines, which are much more numerous than in *B. lineata*.

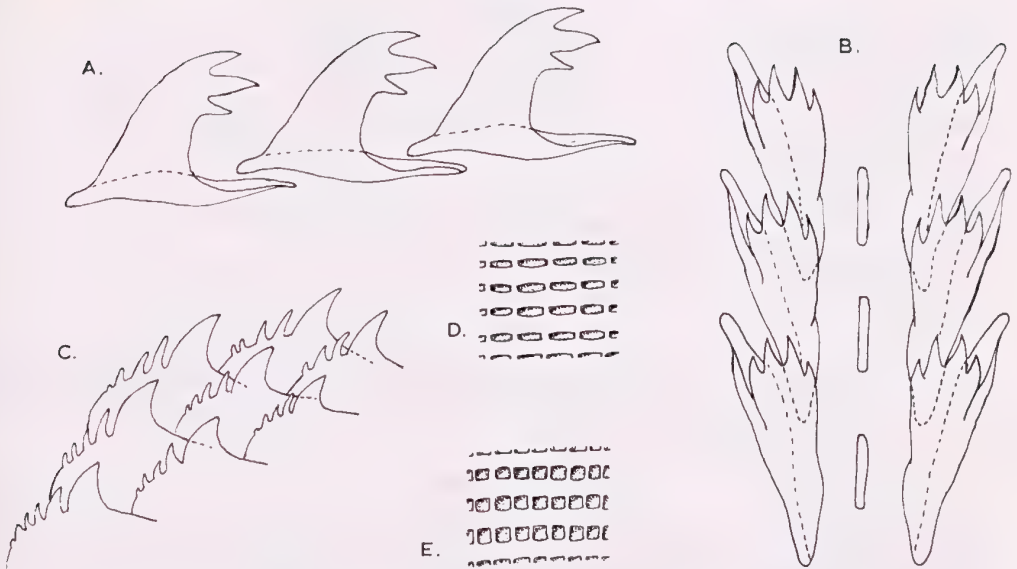


Fig. 2. A - D, *Bullina lineata* (Gray), E, *Bullina* sp.  
 A, radula teeth, lateral view; B, radula, dorsal view of central and inner laterals; C, part of jaw plate; D, sculpture of shell; E, sculpture of shell of *Bullina* sp. (see text).

It is most probable that the specimen illustrated here from New Zealand, belongs to this species. Pilsbry (1920) described a subspecies, *B. scabra solida*, as "differing from *B. scabra* (ie. *B. lineata*) by its solidity, the lip being far thicker. The fold near the upper end of the straight columella is much stronger". Although Pilsbry does not specifically mention the numerous wavy axial red lines, the illustration accompanying his description shows that this subspecies is conspecific with *B. lauta*.

The specimen illustrated, from the Gardner collection, unfortunately has no locality information other than that it is from New Zealand. A broken specimen was found in the Dominion Museum collection and was collected from the Cavalli Islands, Whangaroa, (J. E. McDonald, November 1952).

This species differs from *B. lineata* in being heavily calcified and in having many more axial red lines. In *B. lineata* there are usually eight to ten axial lines on the body whorl, whereas in this species there are seventeen to eighteen.

As with *B. melior* lack of information on the soft parts prevented certain identification of this species.

#### *Bullina* sp.

Pl. 18, E; Fig. 2 E

Shell, ovate, bulloid; white with two double red spiral lines, the double lines breaking each whorl into three approximately equal parts. No markings around base of shell. In each pair of spiral lines, the lower

is more dominant. Seven equi-spaced axial red lines present, running from suture to upper red spiral, and from there to lower red spiral. No axial lines on basal third of whorl. Spire completely suppressed, but not sunken. Sculpture differing markedly from *B. lineata* and *B. roseana*; strong smooth spiral ridges, separated by deep punctate grooves of same width as ridges. Grooves crossed by transverse ridges forming rows of hollow squares.

Aperture large, narrowing at upper end but not at base; outer lip joins body whorl mid-way between suture and upper red spiral line. Suture deeply channelled. Columella weak, straight, truncated at base, only weakly recurved. Umbilicus indistinct. Inner lip forming glaze over aperture region of body whorl. Animal unknown.

#### REMARKS:

The specimen was collected from the Bay of Islands by Mr and Mrs M. Hancock. It is now deposited in the Dominion Museum collection, Reference No. M24091.

Shell height 12 mm; width 8 mm.

#### REMARKS:

This specimen may well prove to be a new species. It is easily distinguished by the flattened spire and the high point of attachment of the upper lip. The thin shell and sculpturing are also distinctive. However, until more is known about the range of variation within the described species of this genus it would be undesirable to describe this as a new species. The number of species of the genus *Bullina* which have been erected on such little evidence are reason enough for my conservative attitude.

### DISCUSSION

All existing species of the genus *Bullina* other than *B. roseana* have been described from the features of the shell alone. Since most species have a white shell, with red markings, difficulties in identification have been experienced by some authors.

*Bullina lineata* and the synonyms *B. scabra* and *B. ziczac* have had a confused history in the literature. This has arisen through nomenclatural problems rather than conchological differences; both *Voluta scabra* and *Voluta ziczac* being preoccupied. It would appear however, that Gray did not nominate a holotype for *Bullina lineata*. Nineteen specimens are in the J. E. Gray collection of the British Museum and were collected from New Holland (Australia). It is possible that more than one species could be present in this collection (J. D. Taylor — pers. comm.).

*Bullina lauta* Pease, 1860 was separated on vague conchological grounds, Pease considering that microscopic lines crossing the spiral ridges were significant. These were no doubt the normal microscopic growth lines. Pilsbry (1893) considers *B. lauta* to be a synonym of *B. lineata* and his copy of Sowerby's drawing (Conch. Icon. xviii, f.5) shows little variation from specimens of *B. lineata* I have seen. Watson (1886), after studying specimens in the British Museum came to the same conclusion. However, as mentioned earlier, photographs of the holotype of *B. lauta* show a feature apparently missed by the early workers. The red axial lines, 8-10 in *B. lineata*, are much more numerous.



## Bullina

Of the other described species, two are yellow, *Bullina callizona* Sakurai and Habe, 1961 with two narrow red spiral stripes and *B. virgo* Habe 1950, with broad red spiral bands.

*B. melior* has been described earlier; *B. vitrea* Pease, 1860 has two or three fine black spiral lines and *B. deshayesii* Pilsbry, 1894 has a pair of black brown lines.

Only two other species are white with red markings: of these, *B. nobilis* Habe, 1950 has a pair of broad red bands and very heavy axial lines; the shape of the shell is also different. The only other described species, *B. brugierii* A. Adams, 1855 has a tall spire and broad spiral bands.

It is possible that some of these species are synonymous, but until more is known of their anatomy, attempts at erecting new species or synonymising existing species on shell characters alone, will only lead to further confusion.

## ACKNOWLEDGEMENTS

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